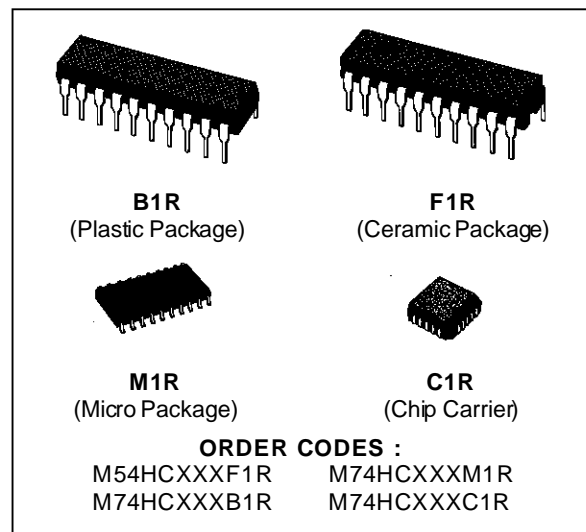


## OCTAL BUS TRANSCEIVER

### HC620 3 STATE INVERTING HC623 3 STATE NON INVERTING

- **HIGH SPEED**  
 $t_{PD} = 10 \text{ ns (TYP.) AT } V_{CC} = 5 \text{ V}$
- **LOW POWER DISSIPATION**  
 $I_{CC} = 4 \mu\text{A (MAX.) AT } T_A = 25^\circ\text{C}$
- **HIGH NOISE IMMUNITY**  
 $V_{NIH} = V_{NIL} = 28 \% V_{CC} \text{ (MIN.)}$
- **OUTPUT DRIVE CAPABILITY**  
 15 LSTTL LOADS
- **SYMMETRICAL OUTPUT IMPEDANCE**  
 $|I_{OH}| = |I_{OL}| = 6 \text{ mA (MIN.)}$
- **BALANCED PROPAGATION DELAYS**  
 $t_{PLH} = t_{PHL}$
- **WIDE OPERATING VOLTAGE RANGE**  
 $V_{CC} \text{ (OPR)} = 2 \text{ V to } 6 \text{ V}$
- **PIN AND FUNCTION COMPATIBLE**  
 WITH LS620/623



#### DESCRIPTION

The M54/74HC620/623 are high speed CMOS OCTAL BUS TRANSCEIVERS fabricated in silicon gate C<sup>2</sup>MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption.

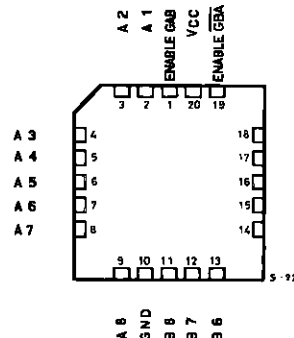
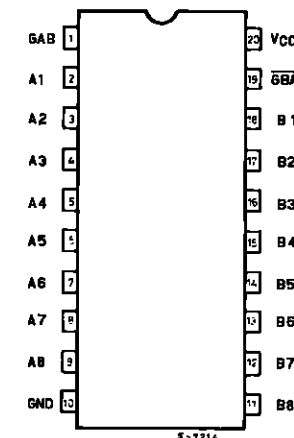
These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control function implementation allows maximum flexibility in timing.

These devices allow data transmission from the A bus to B bus or from the B to the A bus depending upon the logic levels at the enable inputs (GBA and GAB). The enable inputs can be used to disable the device so that the buses are effectively isolated.

The dual-enable configuration gives these devices the capability to store data by simultaneous enabling of GBA and GAB.

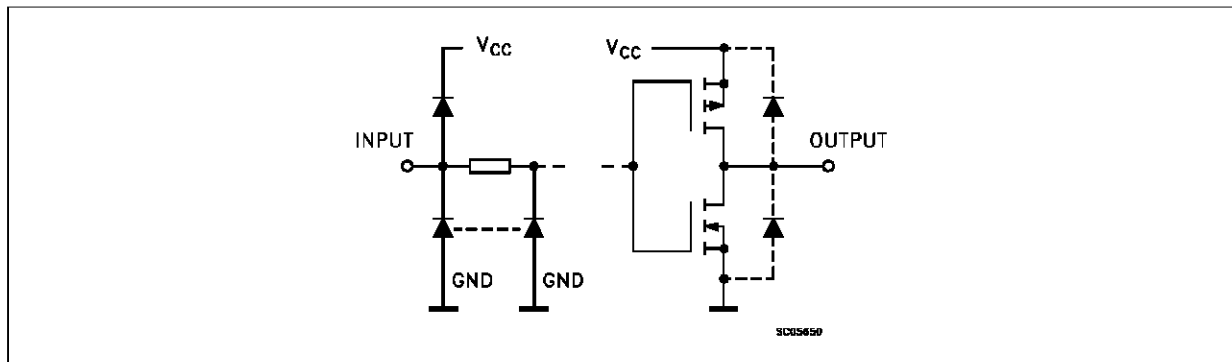
Each output reinforces its input in this transceiver configuration. Thus, when both control inputs are enabled and all other data sources to the two sets of bus lines are at high impedance, both sets of bus lines (16 in all) will remain at their last states. The 8-bit codes appearing on the two sets of buses will be identical for the 'HC623 or complementary for the 'HC620. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

#### PIN CONNECTIONS (top view)



NC =  
No Internal  
Connection

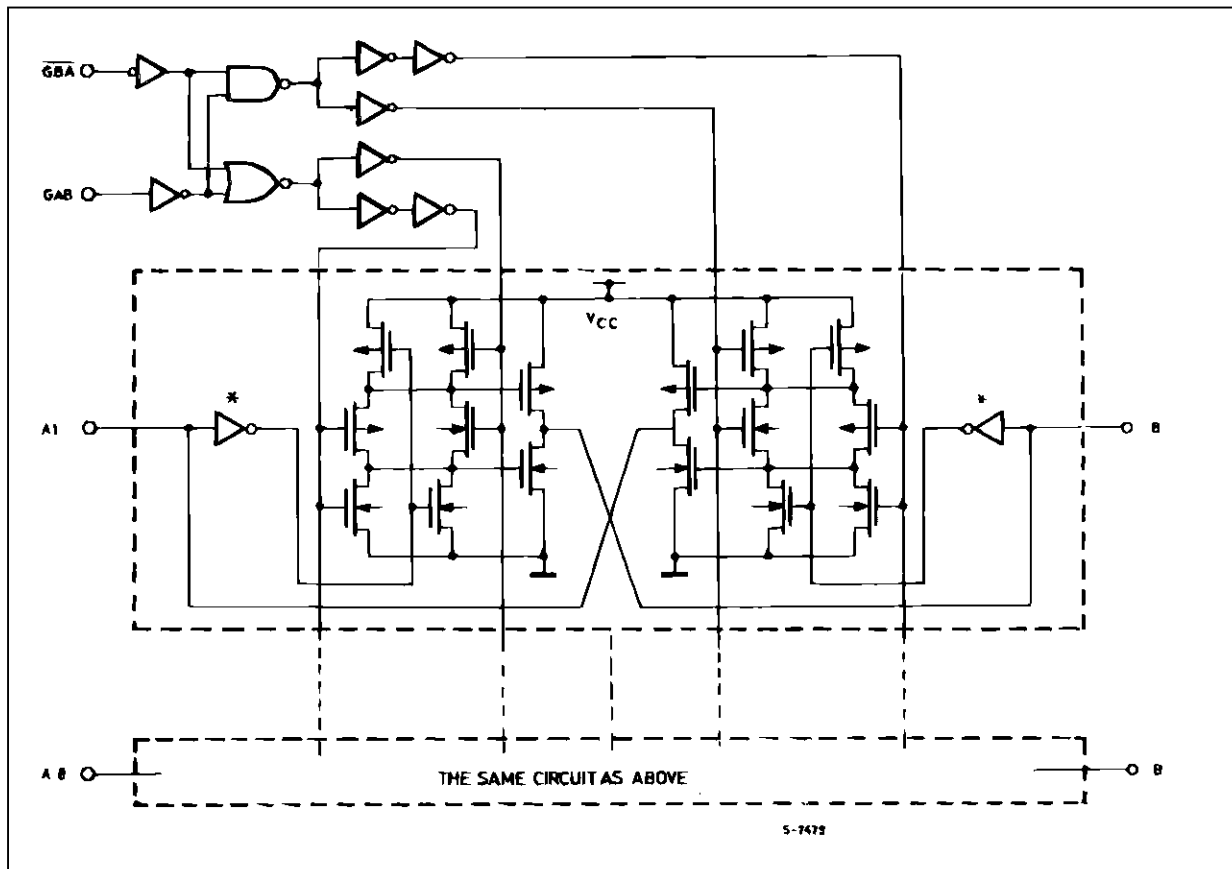
# INPUT AND OUTPUT EQUIVALENT CIRCUIT



# TRUTH TABLE

INPUTS		FUNCTION		OUTPUTS	
GAB	$\overline{GAB}$	A Bus	B Bus	HC620	HC623
L	L	Output	Input	$A = \overline{B}$	$A = B$
H	H	Input	Output	$B = \overline{A}$	$B = A$
L	H	High Impedance		Z	Z
H	L	High Impedance		Z	Z

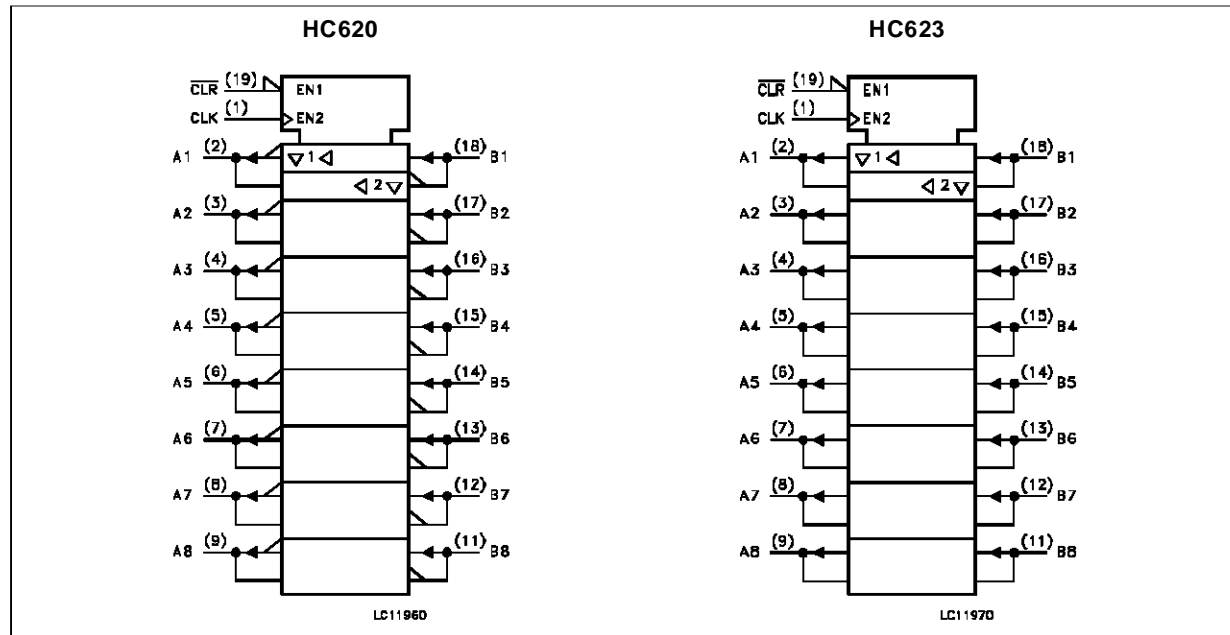
# LOGIC DIAGRAM



## PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 19	$\overline{\text{GBA}}$ , GAB	Direction Controls
2, 3, 4, 5, 6, 7, 8, 9	A1 to A8	Data Inputs/Outputs
11, 12, 13, 14, 15, 16, 17, 18	B1 to B8	Data Inputs/Outputs
10	GND	Ground (0V)
20	V <sub>CC</sub>	Positive Supply Voltage

## IEC LOGIC SYMBOLS



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7	V
V <sub>I</sub>	DC Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>O</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	± 20	mA
I <sub>OK</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Source Sink Current Per Output Pin	± 35	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 70	mA
P <sub>D</sub>	Power Dissipation	500 (*)	mW
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(\*) 500 mW: ≡ 65 °C derate to 300 mW by 10mW/°C: 65 °C to 85 °C

**RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter		Value	Unit
V <sub>CC</sub>	Supply Voltage		2 to 6	V
V <sub>I</sub>	Input Voltage		0 to V <sub>CC</sub>	V
V <sub>O</sub>	Output Voltage		0 to V <sub>CC</sub>	V
T <sub>op</sub>	Operating Temperature: <b>M54HC Series</b> <b>M74HC Series</b>		-55 to +125 -40 to +85	°C °C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time	V <sub>CC</sub> = 2 V	0 to 1000	ns
		V <sub>CC</sub> = 4.5 V	0 to 500	
		V <sub>CC</sub> = 6 V	0 to 400	

**DC SPECIFICATIONS**

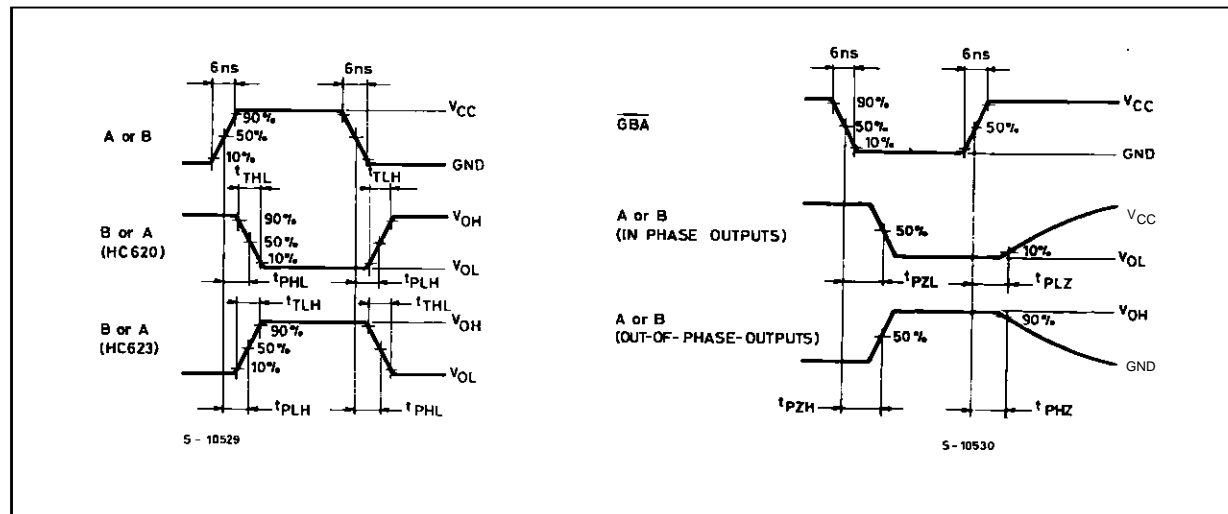
Symbol	Parameter	Test Conditions				Value					Unit			
		V <sub>CC</sub> (V)			T <sub>A</sub> = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC				
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.		
V <sub>IH</sub>	High Level Input Voltage	2.0			1.5			1.5		1.5		V		
		4.5			3.15			3.15		3.15				
		6.0			4.2			4.2		4.2				
V <sub>IL</sub>	Low Level Input Voltage	2.0					0.5		0.5		0.5	V		
		4.5					1.35		1.35		1.35			
		6.0					1.8		1.8		1.8			
V <sub>OH</sub>	High Level Output Voltage	2.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> =-20 μA	1.9	2.0		1.9		1.9		V		
		4.5			4.4	4.5		4.4		4.4				
		6.0			5.9	6.0		5.9		5.9				
		4.5		I <sub>O</sub> =-6.0 mA		4.18	4.31		4.13		4.10			
		6.0		I <sub>O</sub> =-7.8 mA		5.68	5.8		5.63		5.60			
V <sub>OL</sub>	Low Level Output Voltage	2.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = 20 μA		0.0	0.1		0.1		0.1	V		
		4.5				0.0	0.1		0.1		0.1			
		6.0				0.0	0.1		0.1		0.1			
		4.5		I <sub>O</sub> = 6.0 mA			0.17	0.26		0.33			0.40	
		6.0		I <sub>O</sub> = 7.8 mA			0.18	0.26		0.33			0.40	
I <sub>I</sub>	Input Leakage Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND				±0.1		±1		±1	μA		
I <sub>OZ</sub>	3 State Output Off State Current	6.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND				±0.5		±5		±10	μA		
I <sub>CC</sub>	Quiescent Supply Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND				4		40		80	μA		

**AC ELECTRICAL CHARACTERISTICS** ( $C_L = 50$  pF, Input  $t_r = t_f = 6$  ns)

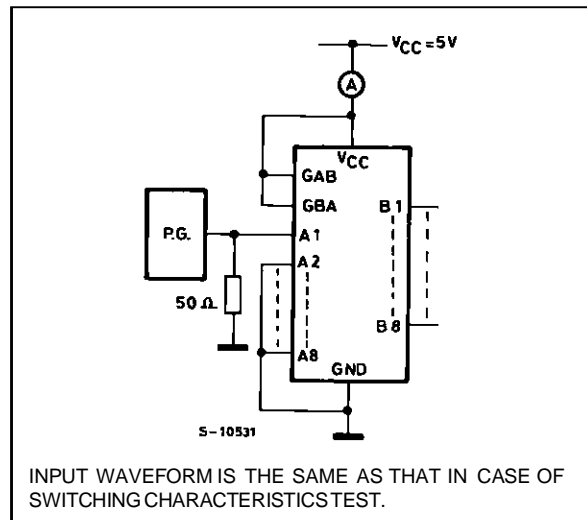
Symbol	Parameter	Test Conditions			Value						Unit	
		V <sub>CC</sub> (V)	C <sub>L</sub> (pF)		T <sub>A</sub> = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time	2.0	50		25	60		75		90	ns	
		4.5			7	12		15		18		
		6.0			6	10		13		15		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (for HC620)	2.0	50		41	100		125		150	ns	
		4.5			12	20		25		30		
		6.0			10	17		21		26		
		2.0	150		55	130		165		195	ns	
		4.5			16	26		33		39		
		6.0			14	22		28		33		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (for HC623)	2.0	50		38	85		105		130	ns	
		4.5			12	17		21		26		
		6.0			10	14		18		22		
		2.0	150		51	130		165		195	ns	
		4.5			16	26		33		39		
		6.0			14	22		28		33		
t <sub>PZL</sub> t <sub>PZH</sub>	Output Enable Time	2.0	50	R <sub>L</sub> = 1 KΩ		57	150		190		225	ns
		4.5				19	30		38		45	
		6.0				16	26		32		38	
		2.0	150	R <sub>L</sub> = 1 KΩ		69	180		225		270	ns
		4.5				23	36		45		54	
		0				20	31		38		46	
t <sub>PLZ</sub> t <sub>PHZ</sub>	Output Disable Time	2.0	50	R <sub>L</sub> = 1 KΩ		43	125		155		190	ns
		4.5				18	25		31		38	
		6.0				15	21		26		32	
C <sub>IN</sub>	Input Capacitance					5	10		10		10	pF
C <sub>PD</sub> (*)	Power Dissipation Capacitance		for HC620 for HC623			32 34						pF

$C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

## SWITCHING CHARACTERISTICS TEST WAVEFORM



## TEST CIRCUIT $I_{CC}$ (Opr.)



## $C_{PD}$ CALCULATION

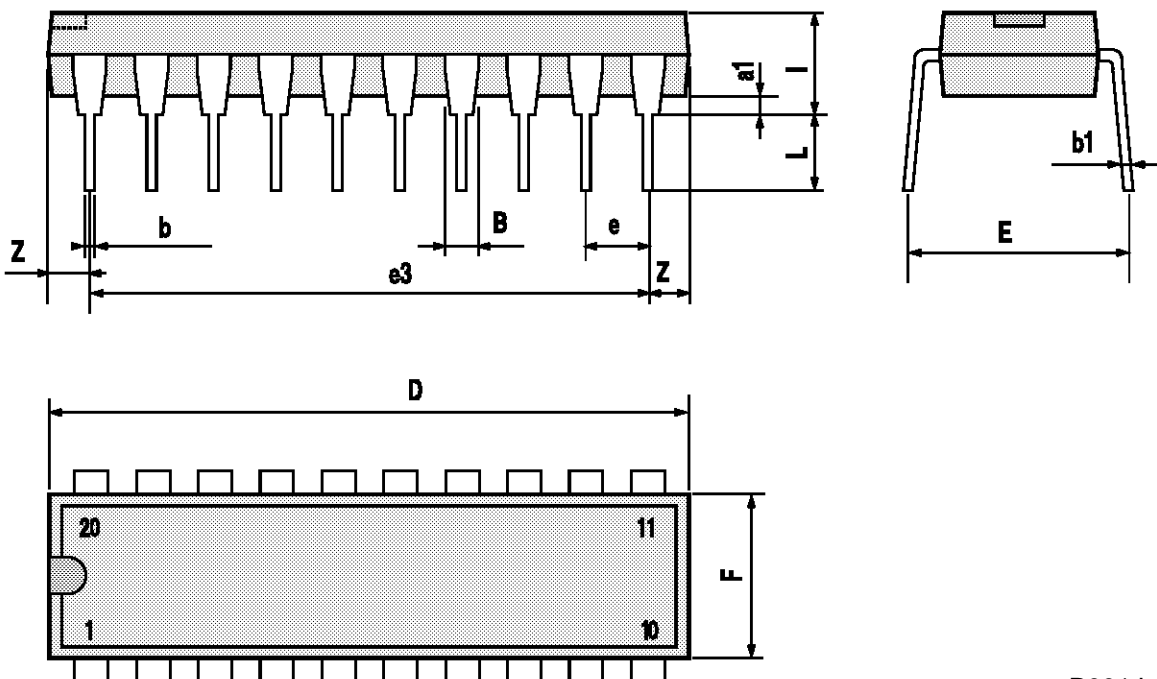
$C_{PD}$  is to be calculated with the following formula by using the measured value of  $I_{CC}$  (Opr.) in the test circuit opposite.

$$C_{PD} = \frac{I_{CC} (Opr.)}{f_{IN} \times V_{CC}}$$

In determining the typical value of  $C_{PD}$ , a relatively high frequency of 1 MHz was applied to  $f_{IN}$ , in order to eliminate any error caused by the quiescent supply current.

# Plastic DIP20 (0.25) MECHANICAL DATA

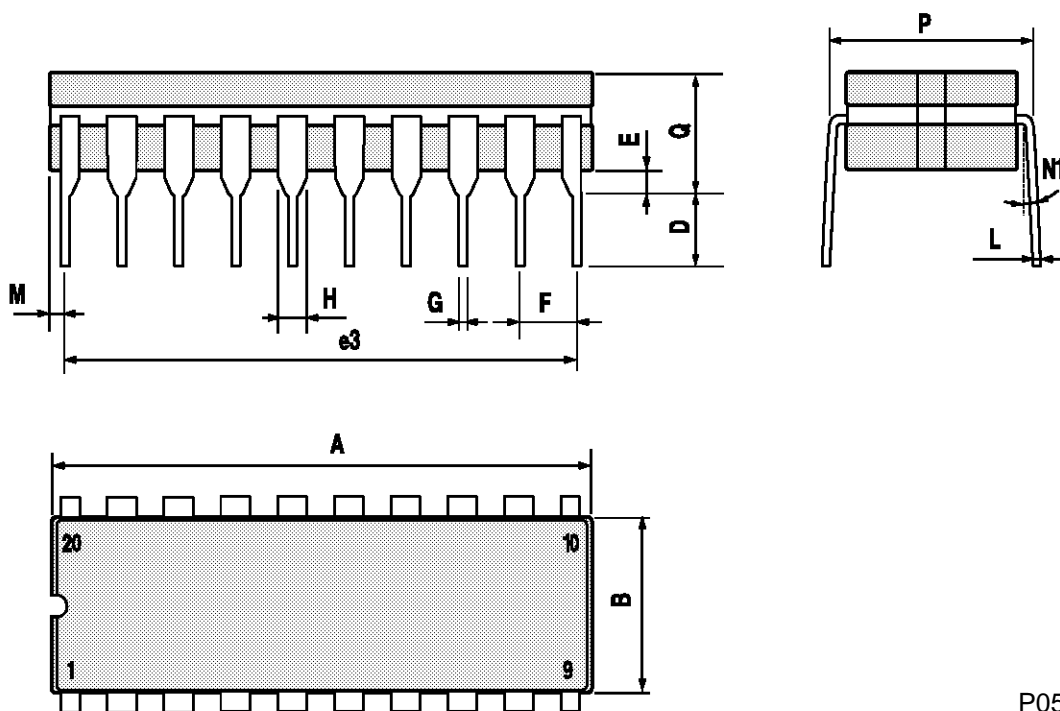
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.45			0.018	
b1		0.25			0.010	
D			25.4			1.000
E		8.5			0.335	
e		2.54			0.100	
e3		22.86			0.900	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053



P001J

## Ceramic DIP20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			25			0.984
B			7.8			0.307
D		3.3			0.130	
E	0.5		1.78	0.020		0.070
e3		22.86			0.900	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
I	1.27		1.52	0.050		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N1	4° (min.), 15° (max.)					
P	7.9		8.13	0.311		0.320
Q			5.71			0.225

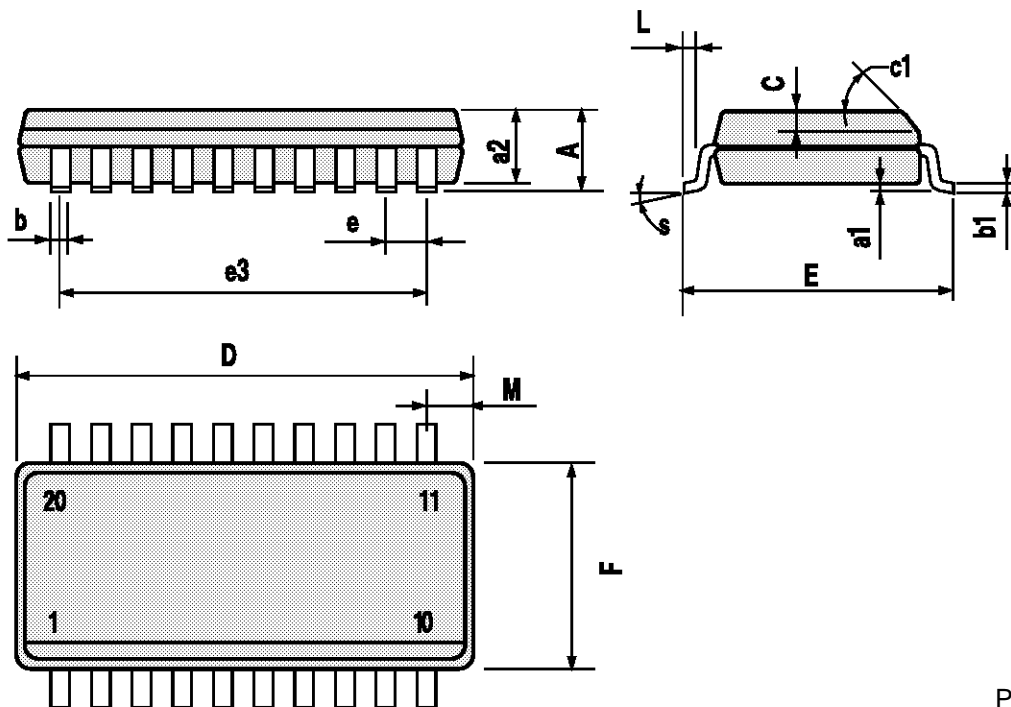


P057H



## SO20 MECHANICAL DATA

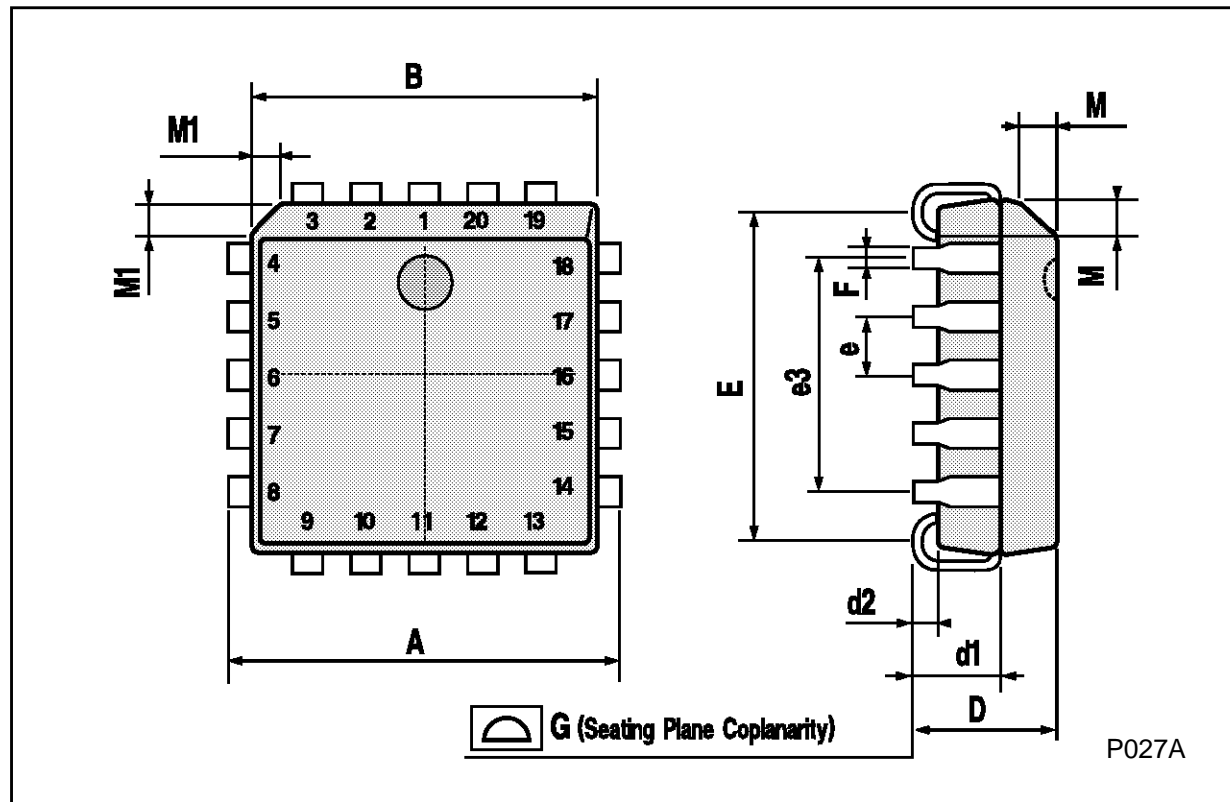
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.10		0.20	0.004		0.007
a2			2.45			0.096
b	0.35		0.49	0.013		0.019
b1	0.23		0.32	0.009		0.012
C		0.50			0.020	
c1	45° (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60	0.291		0.299
L	0.50		1.27	0.19		0.050
M			0.75			0.029
S	8° (max.)					



P013L

## PLCC20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	9.78		10.03	0.385		0.395
B	8.89		9.04	0.350		0.356
D	4.2		4.57	0.165		0.180
d1		2.54			0.100	
d2		0.56			0.022	
E	7.37		8.38	0.290		0.330
e		1.27			0.050	
e3		5.08			0.200	
F		0.38			0.015	
G			0.101			0.004
M		1.27			0.050	
M1		1.14			0.045	



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